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ABSTRACT

Cognitive imaging was investigated as one factor associated with the development of the University of New Mexico from an undergraduate teaching institution toward becoming a nationally-ranked graduate research university. A longitudinal, ethnohistorical study was undertaken for the 1967-1978 period. The qualitative research methodology involved an extensive review of institutional documents and informal interviews with key university administrators. Creating a cognitive image of the university's future appears to have enabled institutional leaders to modify the institution's organizational structure, including the establishment of the Office of the Vice President for Research, promoting campus research, securing external research support, and protecting faculty research interests. All of these steps were part of the institution's creation of a new image as a research university. Statistics on research performance were used to judge the university's success in the transformation. The measures involved, including research proposals submitted, proposals funded, and research expenditures, appeared to contribute to the changing image of the university as a research institution. Theoretical propositions suggested by the creation of the university's cognitive image are identified. (Author/SW)

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THE FUNCTION OF COGNITIVE IMAGING IN A DEVELOPING RESEARCH UNIVERSITY

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ABSTRACT

THE FUNCTION OF COGNITIVE IMAGING IN A DEVELOPING RESEARCH UNIVERSITY

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Cognitive imaging, as a factor associated with the development of the University of New Mexico from an undergraduate teaching institution toward a nationally-ranked graduate research university, is the focus of this longitudinal, 1967-1978, ethnohistorical study. The qualitative research methodology used for this institutional study employed an extensive review of institutional documents and informal interviews with key university administrators. Creating a cognitive image of the university's future appears to have enabled institutional leaders to modify the institution's organizational structure including the establishment of the Office of the Vice President for Research, promoting campus research, securing external research support, and protecting faculty research interests. Cognitive imaging was associated with the university's emergence as a nationally-ranked graduate research institution.

Introduction

The principal objective of this study has been to discover, examine, and explain cognitive imaging as one factor associated with the development of the University of New Mexico from an undergraduate teaching institution in the direction of a nationally-ranked graduate research university. The University of New Mexico was selected as the unit of study because it was representative of a group of Rocky Mountain and High Plains universities that appeared to be engaged in similar developmental activities during a period of uncertainty about the federal government's commitment to university research support and provided a unique opportunity to study institutional development.

Methodology

The dynamic process through which an institution of higher education responds to change in its external environment and develops from an undergraduate teaching institution to a graduate research university is not well understood. The literature on institutional adaptation to external environmental change is essentially atheoretical in nature and contains little work designed to test theories describing the dynamics of the change process (Giaquinta, 1973, p. 178).

This study focuses on a highly particular slice of the University's research environment and is directed toward developing a set of naturalistic generalizations and building theory rather than toward affirming a prevailing theory. The significance of discovering theory from data, the generation of "grounded theory" (Glaser and Strauss, 1967), lies in the researcher's ability to arrive at relevant

"predictions, explanations, interpretations and applications" (p. 1) that are both empirically sound and singularly pertinent to the phenomenon under study.

Rationale

The choice of research methodology was determined by the nature of the problem under investigation (Lofland, 1971; Schumacher, 1972). This study employed an ethnohistorical research methodology described by Schumacher (1972) and Smith (1978) that Filstead (1979) allowed the researcher to get close to the data, obtain first-hand knowledge and develop the "analytical, conceptual, and categorical components of explanation from the data itself" (Filstead, 1979, p. 33). Reality, meaning, and behavior were analyzed from the subject's perspective. This flexible field study approach allowed the researcher to obtain a rich contextual understanding of events which proved a powerful way to comprehensively understand (Babbie, 1979) the phenomenon of cognitive imaging in context.

Data Collection

In utilizing qualitative research methodology for the study of organizations, it is important to employ a wide variety of data collection techniques to ensure the flexibility necessary to gathering relevant data (Glaser and Strauss, 1967) and to assuring the validity and reliability of the data. The ethnohistorian attempts to go beyond the "official" description of events and to include personal recollections, anecdotes, and quotations in an attempt to develop a vivid, provocatively-rich account of events. To accomplish this goal, a combination of qualitative research techniques was employed. By analyzing documents such as memoranda, desk logs, letters, written

reports, minutes of board meetings, proposals, journal articles, newspaper accounts and press releases, explicit knowledge was obtained and organized into a longitudinal historical record that chronicled events during the "bounded" (Stake, 1978, p. 7) period of time 1967-1978. Through informal interviews, the researcher obtained additional, explicit information and "tacit knowledge" (Polyani, 1958) about those pre-verbal understandings of events pertinent to the research effort.

Through this "multi-method" (Smith and Pohland, 1972, p. 11), opportunities became available to follow Iannaccone's (1975) "reiterative cycle" of definition, data collection, analysis and examination of concepts, and subsequent redefinition, as need emerged from the data, generated by this "disciplined inquiry" (Cronbach and Suppes, 1969).

In most qualitative studies, it is common practice to mask the identity of persons and places when developing the descriptive narrative. Rist (1982) notes that masking "becomes difficult as too much data is supplied" (p. 10) about people, events and places. The University of New Mexico's involvement in the establishment of a Consortium of Rocky Mountain and High Plains universities, the Western Regional Scientific Laboratory, Inc., and its attempt to manage the Los Alamos Scientific Laboratory, all of which are described and analyzed in this study, are unique. For all these reasons it was decided, therefore, to retain the identities of persons, places and events with the provisions of review and comment by the participants. This process also contributed to the study's validity.

Data Analysis

An effort was made to correlate and analyze the data during the collection phase of this study. Categories developed as a result of preliminary studies were coded and examined for a "goodness of fit" (McCall and Simmons, 1969, p. 233), with new data emerging from interviews and documents during the last seven months of the study. These categories were refined through constant comparison (Glaser and Strauss, 1967) between the original definitions and the emerging data.

The process of data collection and analysis was refined, focused and directed through the process of "theoretical sampling" suggested by Glaser and Strauss (1967, p. 45). By examining and comparing the contexts and concepts, probable relationships were formulated and examined. Through this process several concepts emerged that were felt to be most applicable in illuminating the phenomena under study and were substantially accounted for in the data. The emergent concepts were then elaborated and ordered in propositional form.

Generation of Theory

The development of "grounded theory," which attempts to explain how universities develop in the direction of research institutions, was the final outcome of the study. However, the immediate applicability of the theory should be reserved. Grounded theories emerge from limited ranges of data and are limited to contextual ranges of applications. The development of "special theories adequate to limited ranges of social data (rather than)...the search for all-inclusive conceptual themes" (Merton, 1957, pp. 9-10) is of paramount importance in this study.

The value of research directed towards developing grounded theory lies not in the validation of existing theory but, rather, in the

discovery of new understandings and perceptions. This study does not assert that the grounded theory developed here will reflect the manner in which all institutions adjust to changes in their environment or the manner in which they will develop in the direction of graduate research institutions. Rather, it is based on the premise that "understanding the response of one institution in one setting may contribute to the fundamental and general understanding of how institutions of higher education respond to their environment and pursue development into research organizations" (Bjork, 1983, pp. 179-180).

Background

The association between science and the federal government is a unique American phenomenon (Veysey, 1963) that has proved to be mutually advantageous: government agencies accomplish their applied research with the assistance of trained university scientists, and the government's support of science provides a source of strength to the emergence of scientific research in institutions of higher education.

Although reliance on colleges and universities for the performance of applied research began on a modest basis during the the latter part of the 19th Century, the pursuit and support of science by the federal government inside universities grew rapidly (Cowley, 1980; Dupree, 1957; Millet, 1952). During the 1930's scholarly and scientific pursuits were recognized as valuable resources in finding solutions to difficult and pressing national economic and social problems. The practice of linking applied science with practical public service developed as a dominant theme in the

federal government's rationale for supporting university-based research.

The relationship between the federal government and the university research community entered a new era during the years just prior to World War II (Corson, 1975) when both the diversity and scale of research expanded and when the government sought the assistance of highly-skilled faculty researchers.

During the early 1960's, federally-sponsored research rapidly became a major campus activity. Federal grants and contracts became the principle means of providing support for scientific research overshadowing university resources as the primary means of funding (Corson, 1975; Kidd, 1959; Strickland, 1967). An indirect result of this shift in research support from the universities themselves to the federal government shaped the fundamental characteristic of government-university relationships during the post-War period (Dupree, 1957; Murphy, 1971; Orlans, 1968) and enhanced the research capabilities of institutions of higher education. The federal government emerged as the principal sponsor of scientific research, and the universities were recognized as the locus for carrying out government research.

The dramatic increase in federal support for university-based research and development between 1953 and 1968, increasing from $1.25 million to $1.9 billion (Smith and Karlesky, 1977, p. 18), had a profound impact on the evolution of established and developing institutions. The literature suggests that federal support stimulated the growth of campus research, shifted institutional emphasis toward graduate education and research training, shaped the direction of

research, dominated its continuance ushered in a new era of political relations between the universities and the federal government, and contributed to the emergence of research as a measure of institutional stature (Babbidge, 1968; Ben-David, 1972; Heimovicks, 1971; Kidd, 1959; Klopsteg, 1959; Price, 1965). The literature suggests that as the external research environment became more dynamic, research universities adapted, some rapidly than others, to the new demands by placing an increased emphasis on research.

Findings

In the years just prior to 1968, when federal support for University-based research and development peaked, an important emphasis was being placed on conducting research by the institutions themselves. Dring this period, the University of New Mexico was characterized as a "young, maturing institution" (personal interview, Travelstead, July 26, 1982) that was in the nascent stages of developing its research capabilities. Research was viewed as an important vehicle through which the quality of instruction, graduate programs and faculty could be improved and as an important vehicle through which the stature of the institution could be enhanced.

The decision to move the institution into the mainstream of academic life by expanding campus research led, in 1967, to the decision to establish the Office of the Vice President for Research. This decision was made by President-elect Heady in consultation with other key administrators and faculty members and was implemented shortly after he became president in 1968. During the 1968-1972

period, under the direction of President Heady, the role of the Office of the Vice President for Research was defined, accepted by the University community and institutionalized. The University, shifted the manner in which it viewed itself internally and the way in which it wanted to be viewed externally. It was a significant shift and a symbolic step in the direction of the maturation of the institution.

Support for developing "a mature institution," however, was available in the experienced person of Dr. Heady, the Academic Vice President and President-elect who took this step in an effort to give direction and emphasis to research" that was important for an institution that hopes to be a great university (personal interview, Travelstead, July 26, 1982).

According to Heady,

> One of the reasons for advocating a Vice President for research was that this would be an indication of more recognition about the importance of research. It would encourage more faculty members to be more active in research and it would be a way of giving recognition for faculty members and departments that had good reputations as researchers (personal interviews, Heady, July 19, 1982).

Dr. Travelstead noted that in addition to these advantages,

> (I)t did say among other things, to other institutions, that we were, in our evolution and growth, trying to recognize and do more in the whole area of research...it helped the image of this institution, that (we were) putting this institution on the line as being interested in and more supportive of research than it had before (personal interview, Travelstead, July 26, 1982).

The administration's support for the institution's shift toward faculty research and enhanced stature through research manifested itself in two significant ways: (1) successful advocacy in the New Mexico State Legislature for an increase in the University's retention and use of overhead; these funds could now support research that would not be charged against the institution's general budget; and (2) successful advocacy in the New Mexico State Legislature for

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reducing research faculty members' teaching loads.

According to Dr. Heady, the idea of establishing the Office of the Vice President "had really been adopted, in principle, before I became President. And, then there was a long period of negotiation and working out the details" (personal interview, Heady, July 19, 1982). Defining the duties and responsibilities was a long-term objective in establishing the Office of the Vice President for Research: "The President-elect (Ferrel Heady) has decided that those functions should be developed and defined gradually and in consultation with those primarily concerned" (Travelstead to Adams, June 17, 1968). The documents and interview data indicate that this consultative process of defining the role and responsibilities of the Vice President for Research was initiated prior to its being established early in Dr. Heady's administration and continued throughout the early years of its existence.

The goal of more effective representation of the institution as a research university was to create higher and more consistent visibility for the University through the designation of a single University official to attend scientific meetings, government research and policy briefings, and professional meetings of research administrators.

The most critical area of pursuing an active research program at the University involved establishing research policy. It was imperative to move existing research policy from a "laissez-faire" arrangement in which individual faculty members or groups decided on their own questions concerning research grants and contracts that impinged on the University towards the development

of an overall research policy. That policy, an important function of the Vice President for Research, was discussed by key stakeholders in the administration and faculty. A Joint Research Advisory Board was established and provided an arena in which administrative and faculty representatives could jointly consider and recommend research policies.

In the Summer of 1972, Dr. George Springer, the first Vice President for Research and Dean of the Graduate School, died. Finding a replacement for Dr. Springer presented the administration "both with an opportunity and a challenge" (Blum to Heady, August 8, 1972), Dr. Blum stated, "considerable improvement in the research climate on campus could be achieved by the right person. Such a person should be an experienced researcher, well respected in Washington as well as by his colleagues (Blum to Heady, August 8, 1972). The Univerity needed "someone who could" devote time and energy to organizing the nexus between scholarly activity at the University and (the)" outside...someone who has the stature and capability to play a major leadership role (Needler to Heady, August 9, 1972).

At this juncture the dual administrative positions of the Vice President for Research and Dean of the Graduate School were separated to enable the newly appointed Vice President for Research, Dr. Paul Silverman, to focus more actively on the development of sponsored research on campus.

Dr. Silverman noted that his vigorous efforts to restructure and focus the Office was supported by President Heady.

> There was a mood and an atmosphere that evolved because of Dr. Heady's identification that this was an important role... and the infrastructure that existed...coalesced to generate a kind of trust that enabled me to speak with...confidence

> about the campus that enabled me to provide leadership that otherwise I could not have done (personal interview, Silverman, March 24, 1982).

Dr. Silverman observed that Dr. Heady:

> gave me more opportunity to devote more time to encouraging research and development...to establishing relationships both within the campus... encouraging developments by my interest, (and) going out and meeting and selling the potentials of the institution, not only on the federal scene (and in the state) but also through an industrial affiliation program (personal interview, Silverman, March 24, 1982).

Faculty support was also forthcoming. According to Travelstead, "faculty in general began to take satisfaction in that this institution had taken and was continuing to take that step which (increased its) prestige and reputation. (It) was making progress toward maturing as an institution by giving more attention to research" (personal interview, Travelstead, July 26, 1982).

By 1974, Dr. Heady's goal of obtaining research funding for the University from outside sources began to be realized. During the 1972-1975 period, when federal funds for university research became relatively static, the institution began to move more aggressively in developing its research capabilities. "(W)hen a lot of (universities in the nation) were retrenching the University of New Mexico was going externally, it was in a marketing...entrepreneurial mode" (personal interview, Kasner, May 20, 1982). The data support this impression. For example, the number of proposals submitted by faculty increased 46% between June 1971-June 1975, from 284 proposals to 613 proposals. The University's expenditure of research, development, and demonstration funds during this period increased (in constant 1972 dollars) 25% from $7.7 million to $9.6 million.

In 1972, for the first time, the University was listed (54th) by the National Science Foundation in its "Total Federal Obligations to 100 Universities and Colleges Receiving the Largest Amounts FY 1972". The University remained on that listing throughout the remaining period studied.

The Vice President for Research through the Office of Research and Fellowships Services provided, among other things, a wide variety of research support services to faculty including information on research opportunities, a research data bank and, a research bulletin listing research proposal deadlines, new contracts and grants awarded and completed. In addition, this Office identified shifts in federal funding policy to assist both the Vice President for Research and research faculty in adjusting strategies and taking appropriate actions. This Office focused on establishing rapport with the faculty and gaining their confidence and support through actively promoting and encouraging research and providing research support services.

The Office of Research and Fellowship Services, under the direction of Mr. Edmund B. Kasner, began publishing a bulletin, Research Notes , that informed faculty members of research opportunities, deadlines and awards. Mr. Kasner indicated:

> I'm not too sure if Research Notes ever, really brought, directly, much research money in. One thing it did do, it let people know that there was an office and it was working on their behalf and that was a big thing (personal interview, Kasner, May 20, 1982).

The federal government was viewed by the University as the major source of research support, so it was the principal focus of the

institution's initiatives in aggressively pursuing research dollars. Dr. Silverman, as part of an aggressive research-development program, began to increase the visibility of the University's research potential by increasing contacts with administrators in federal agencies and among members of the State's Congressional Delegation. Dr. Silverman and Mr. Kasner began a program of actively representing the University and "making calls on various agencies, seeing the people and getting a degree of rapport going... it was a marketing-type, a salesmanship-type of thing. (And)... every time I did go back (to Washington) I always paid a call on the Congressional Delegation" (personal interview, Kasner, May 20, 1982).

To a lesser extent, because of the limited availability of research funds, Kasner also initiated and maintained similar contacts with members of the New Mexico State Legislature and state agencies. The data indicate that the purpose of this activity was to generate information in support of faculty research as well as to represent the capabilities and image of the University as a research institution.

After the 1973 Arab oil embargo, interest in energy-resource development increased substantially in New Mexico. The University participated in an intra-state research development plan to apply the research capabilities of New Mexico universities to the national energy crisis. According to Silverman:

> We convinced (Governor) Apodaca, at that time, to use some of the severance tax money to set up our own state (research) capacity so we could build up our (university)...in a way that would increase our visibility. We provided information,

> we provided programmatic goals that were politically useful and...meaningful. When we (received) federal funds for (research), we made sure that the political representatives and others were well-aware of what we were trying to do. It was a matter of communication and information (personal interview, Silverman, March 24, 1982).

During 1972-1975, when the University was establishing itself as a more aggressive research institution, it began to affiliate itself informally with other Rocky Mountain and High Plains universities that shared common research interests. This group, the Intermountain University Research Administrators (IMURA) cooperated on a number of programs designed to strengthen their respective positions in competing for research support. The University of New Mexico's involvement in IMURA also had an important parallel benefit; as Dr. Travelstead noted,

> I think it did say, among other things, to other institutions, that we were, in our evolution and growth, trying to recognize and do more in this whole area of research...I'm sure it helped the image of the institution (that we were)...interested and supportive of research (personal interview, Travelstead, July 26, 1982).

The national energy crisis brought on by the 1973 Arab oil embargo and the subsequent Congressional enactment of the Energy Reorganization Act of 1974 brought the Rocky Mountain region's energy reserves and research capabilities into sharp focus when plans for "energy self-sufficiency" were developed.

The Energy Research and Development Administration (ERDA) was created and was charged "with the responsibility for developing or increasing the efficiency and reliability of all energy sources" (synopsis of the LASL Management Project, UNM, 1977, p. 3). ERDA's mission effectively translated into a substantial energy research

and development effort in which it planned to involve universities in a number of significant ways.

In June 1975, ERDA published a National Plan for Energy Development and Demonstration-ERDA 48 , which indicated that ERDA would contract for a substantial number of research programs, encourage joint research and development projects, including the management of government facilities, coordinate energy research and development efforts with the private sector and with universities, and solicit planning assistance from regional groups. Following the publication of its national plan, ERDA convened a two-day meeting in November 1975 to solicit university participation in its joint efforts. At this conference Dr. Robert Seamans, Jr., ERDA Administrator, said that "ERDA (would) deal with the universities as professional partners in the overall national energy research and development effort" (A Summary: Western Universities Propose to Manage the Los Alamos Scientific Laboratory, UNM, 1977, p. 5). According to Dr. Silverman who attended this meeting, Dr. Seamans' statement was viewed at the University of New Mexico as an indication that universities would play an important part in ERDA's effort to pursue the goal of energy independence for the nation.

Dr. Silverman became concerned that "Sandia and Los Alamos (Scientific Laboratories) were beginning to move...into all the areas that previously they did not engage and which have been very largely the areas in which we, at the University, were competing. That was our major problem" (personal interview, Silverman, March 24, 1982). Dr. Silverman was concerned with the implications of LASL's emergence as an energy research laboratory, LASL's competition with the

University for research support, its proselytizing of University faculty researchers, and the resulting reduction of the institution's capacity to compete effectively in certain research areas became important concerns. LASL's move into a competitive position with the University of New Mexico and other regional universities foreshadowed a far more reduced participation than regional university administrators initially expected.

The Intermountain University Research Administrators (IMURA) held its March 1976 meeting at the University of New Mexico which was attended by ERDA representatives. The members of IMURA discussed university participation in energy research during which several relationships between the universities and ERDA were reviewed. Dr. Silverman noted the concerns of the regional universities.

> ERDA's overtures to the Nation's universities confirm that ERDA expects the universities to become deeply engaged in solving the scientific, technical, and social problems that will lead to successful and acceptable new commercial energy developments.
>
> This interest is certainly mutual. The universities of the undeveloped Western states...possess many well developed capabilities in the social sciences as well as in mathematics, physics, chemistry, biology and computer sciences, and in specialties within these fields relating directly to energy research and development. These regional universities expect to participate as full partners with ERDA in energy-related research in these basic scientific fields, engineering, and social sciences (Synopsis of the LASL Management Project," UNM, 1976, pp. 8-9).

The universities' position was that: (1) they would accept ERDA's recent overtures to insure the involvement of regional universities in their research program at face-value; (2) they were convinced that LASL was emerging as an important regional energy-research facility; and (3) they wanted to establish a

functional role for the universities within LASL's energy-research program.

On May 17, 1976, ERDA held a Western regional meeting in Denver, Colorado. The meeting included representatives of regional universities and energy coordinating agencies. During a meeting between several university representatives and ERDA, administrators indicated that a review of the LASL-University of California contract was in progress and that "there was still time for the universities to submit a competing proposal (to manage LASL) if they acted quickly" ("Synopses of the LASL Management Project," UNM, 1976 p. 4). Several other developments within ERDA were discussed during the May 17, 1976, meeting that suggested the direction ERDA would take in pursuit of its future research program: (1) ERDA announced it would begin to decentralize its operations and would establish regional offices in Denver and San Francisco to facilitate its working relationship with its laboratories, government agencies, universities, and industry; (2) LASL, with ERDA's support, presented a proposal that it become a regional energy laboratory that would manage the administrative, fiscal aspects and provide direction for ERDA's regional energy-research program. The regional research universities objected to LASL's circumscribing their involvement in regional energy research by managing ERDA's research programs and substituting an administrative support unit that would replace the competitive peer review process. The expectations of the regional research universities had been substantially diminished since the November and December 1975 meetings with Dr. Seamans, Jr., at ERDA offices in Washingon, D.C., and now LASL's emergence as

ERDA's regional energy laboratory and its control of regional energy research caused concern within the IMURA group.

By mutual agreement of IMURA, Dr. Silverman was to direct the group's LASL management proposal and undertake the formation of a consortium. The Western Regional Scientific Laboratory, Inc. (WRSL, Inc.), of Rocky Mountain and High Plains universities. The events that unfolded between late June 1976 and April 1978 indicate that the University of New Mexico and the other regional member universities of WRSL, Inc., focused on jointly promoting their research capabilities and attempted to prevent LASL from circumscribing their research role in ERDA's energy-research program. The regional universities recognized LASL's unfair advantage, as a national laboratory, in competing for energy-research support, foresaw a drain on their own research faculty by LASL, and LASL's potential monopolization of energy-research in the region. Although the universities' attempt to manage LASL failed, their vigorous efforts towards presenting their concerns as research institutions in the political arena and media did have a significant impact on ERDA's plans to make LASL a regional laboratory. ERDA confirmed that LASL would remain primarily a weapons laboratory which effectively prevented the Laboratory from becoming a substantial competitor to regional universities for energy-research support. The ERDA also dropped its plans of designating LASL as a regional laboratory that would review proposals and control the flow of energy research support.

Analysis

A review of the literature on cognitive imaging suggests that the processes of initiation, innovation, and institutionalization

are not restricted to new organizations. Many existing organizations go through similar transformations at various points in their histories (Kimberly, 1980) and in the process reveal the dynamics of creating and maintaining cognitive images. Thompson (1967) observes that organizations face uncertain futures and their survival is a concern of both focal organizations and other organizations in their task environments. Even if an organization is confident of its ability to face future demands, it must nonetheless create an image of itself, persuade others to share a similar view (Sproull and Weiner, 1979), and translate that image into actions (Rein and White, 1976). Defining a situation in an organization is an important, preliminary task. This task precedes the creation of an image of an organization's future through social processes and contributes to the success of that new public face.

Cognitive imaging in an organization suggests that creating and facilitating change by gaining internal and external support is a complicated process. Defining an organization's situation, specifying reasons for failure of current action, and speculating on how its future can be different and more successful are critical human characteristics that are fundamental to the transformative process. Kimberly (1980) notes that during such transformations, particular administrators can exert substantial influence by defining organizational situations and providing future directions. Creating a cognitive image of the future organization is a crucial element in gaining internal and external support for change. Creating the cognitive image of an organization's future state of affairs requires strong administrative direction and, as a social

process, involves enlisting the support of individuals within the task environment. Individuals who become associated with the social construction of the organization's cognitive image contribute to its viability. They provide information about the internal and external task environment, contribute to shaping the image, add to its legitimacy, assist in mobilizing support, confirm the correctness of the transformation decision, and continue to support the new public face created. Sproull and Weiner (1978) note that the more successful the situation-defining and image-creating process, the more specific the criteria will be against which implementation can be judged.

According to Thompson (1967), organizations facing dynamic external task environments seek to be measured favorably in relation to comparable organizations. Yet absolute criteria on organizational fitness for future performance are rarely present. In their absence, universities may use the number of grants and amount of expenditures for research as indicators of their fitness (Caplow and McGee, 1958; Eaton, 1962). When the external task environment lacks the technical ability to assess evidence of organizational performance, it may seek to utilize proxy measures of fitness for future action. Proxy measures are important to the internal and external cognitive image of the organization (Thompson, 1967). The concept of extrinsic prestige (Perrow, 1961), a proxy measure, suggests the symbolic evaluation of research by counting the number of grants received or the institution's national ranking on the basis of research expenditures. Thompson (1967) notes that "when competing for support, organizations seek prestige, which is a way of gaining

power without increasing its environmental dependency (p. 38)."

Propositions

With the assistance of key administrative and faculty leaders, the University's situation was redefined and a new direction as a research institution was chartered. The restructuring of the University internally, through the establishment of the Office of the Vice President for Research, and its new emphasis, internally and externally, on research was projected by its increased contacts with the New Mexico Legislature, its membership on the Governor's Science and Technology Committee, its petitions for State support of university-based energy research, its participation in IMURA, its increased contacts with key administrators in federal funding agencies, and its intensified contacts with New Mexico's Congressional Delegation. All of these steps were part of the institution's creation of a new image as a research university.

The data indicate that the University relied on proxy measures of research performance to judge its success in transforming itself into a research institution. The total number of research proposals submitted, proposals funded, total RD&D expenditures, and its ranking in the National Science Foundation's report on the "Top 100 Colleges and Universities Receiving Federal Support for Research and Development Activities 1972-1978" dominated its reports. Statistics were used both for internal and external consumption in projecting and sustaining the University's image as a research institution.

Over the 1967-1978 period studied, the number of proposals

submitted increased 382% from 270 to 1,032; research and development expenditures increased 185% from $6.5 to $12 (in constant 1972 dollars) million during a period when federal expenditures for university research support had reached a static level nationwide; and its ranking by the National Science Foundation. These proxy measures appeared to contribute to the image of the University as imbued with a sense of mission and moving towards increasing stature as a research institution.

In brief, the University defined its situation and created a cognitive image of its future as a research institution. It persuaded others to share that view and translated that image into purposive action. The creation of a cognitive image of the University as a research institution was a social process involving people both internally and externally. The proxy measures of the University's RD&D activities provided the institution with a yardstick against which it could measure its fitness with others in its league. These measures provided useful indicators of its RD&D growth as well as a means through which it could attain national prestige.

The creation of the University's cognitive image suggests the following propositions.

1.0 The more imperative a structural change, the more critical the involvement of influential persons.

1.1 The greater the involvement of influential persons, the greater the emphasis upon institutional definition and cognitive imaging.

1.2 The greater the concern for cognitive imaging, the greater the utilization of proxy measures of success.

1.3 The broader (internally and externally) the representation of persons in institutional definition and imaging, the more

likely goals will be attained.

Toward a Theory of Cognitive Imaging in a Developing Research University

Zetterberg (1965) notes that to ask for an explanation of a phenomenon is to ask for a theory. The propositions suggested by the data that are related to the phenomenon of the emergence of the University of New Mexico as a graduate research institution is a review of what has been learned about cognitive imaging from this unique study of a single institution. Cognitive imaging is a "determinent" (Zetterberg, 1965) and its corresponding properties emerged from the data. A limited but "grounded" theoretical explanation (Glaser and Strauss, 1967) of the phenomenon of the development of the University in the direction of a graduate research university is presented as a statement that concludes the analysis and can be summarized thus:

> The development of an undergraduate teaching institution in the direction of a graduate research university is partially explained as a function of the degree of effort towards and success at cognitive imaging.

Significance of the Study

Organizations are social inventions that are both fluid and dynamic. They move in time and space, act and react, and are shaped by a combination of external and internal environmental factors that both threaten survival and provide impetus for modification. The manner in which environmental influences affect organizations and the adaptive mechanisms utilized by University leaders are important foci for organizational research.

This ethnohistorical study of the University of New Mexico is unique in both setting and purpose. It represents the first ethno-

historical effort to contextually examine cognitive imaging as a factor associated with the development of a graduate research university at a time when federal funding for research support remained at a relatively static level. This study provides a contextually rich historical description of a variety of forces that influenced some members of the faculty and administration of the University of New Mexico to take a particular course of action that shaped the future character of the institution.

It is hoped that any conclusions drawn from this research effort will contribute to the ability of universities to understand the forces that are associated with the emergence of research institutions. At the very least, it is hoped that this study will contribute to the literature on how universities adapt to changes in their external research support environment and the utilization of cognitive imaging as a mechanism associated with the development of research universities.